Class Information
SCC0251 – Image Processing

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Instituto de Ciências Matemáticas e de Computação – USP

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Agenda

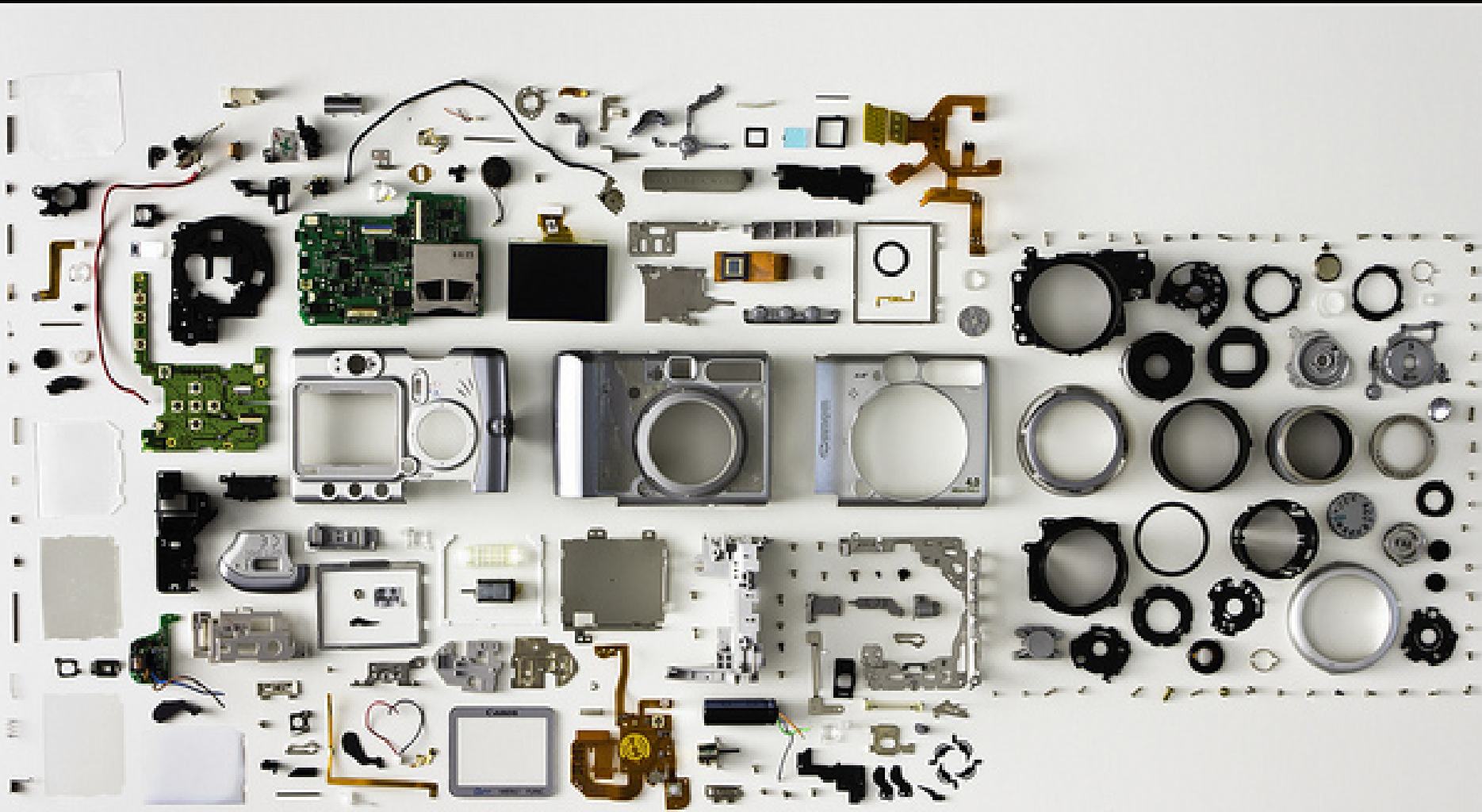
1. Course
   - Objectives
   - Contents
2. History and typical image sources
   - Programming language
3. Grading
4. Contents repository

Objectives

- Provide the student with the knowledge necessary to manipulate digital images, presenting relater application areas and major techniques in the field.

Contents

- Image processing fundamentals: acquisition and modelling
- Gray-level transformations and image filtering
- Image enhancement
- Fourier Transform and frequency domain operations
- Image restoration
- Image segmentation
- Colour images
- Mathematical morphology
- Image analysis: feature extraction and classification
- Convolutional neural networks

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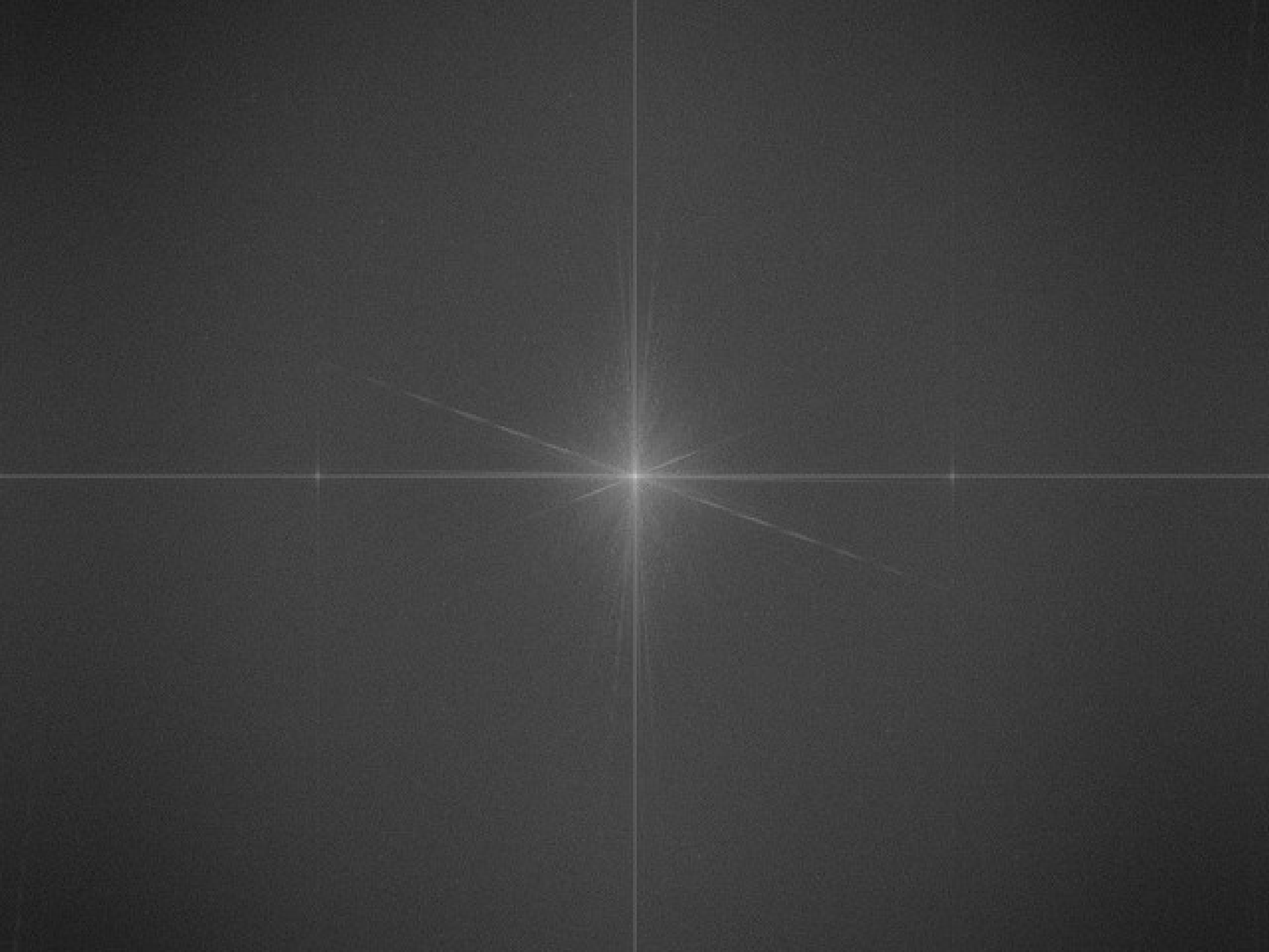

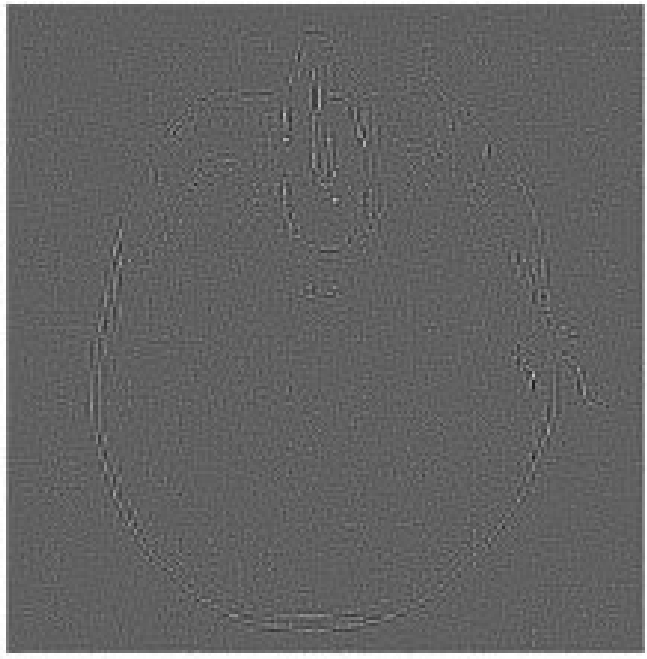

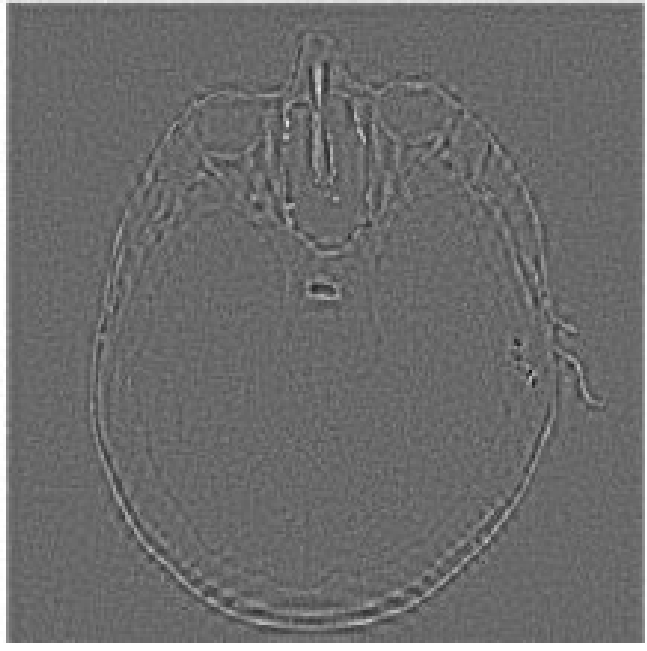

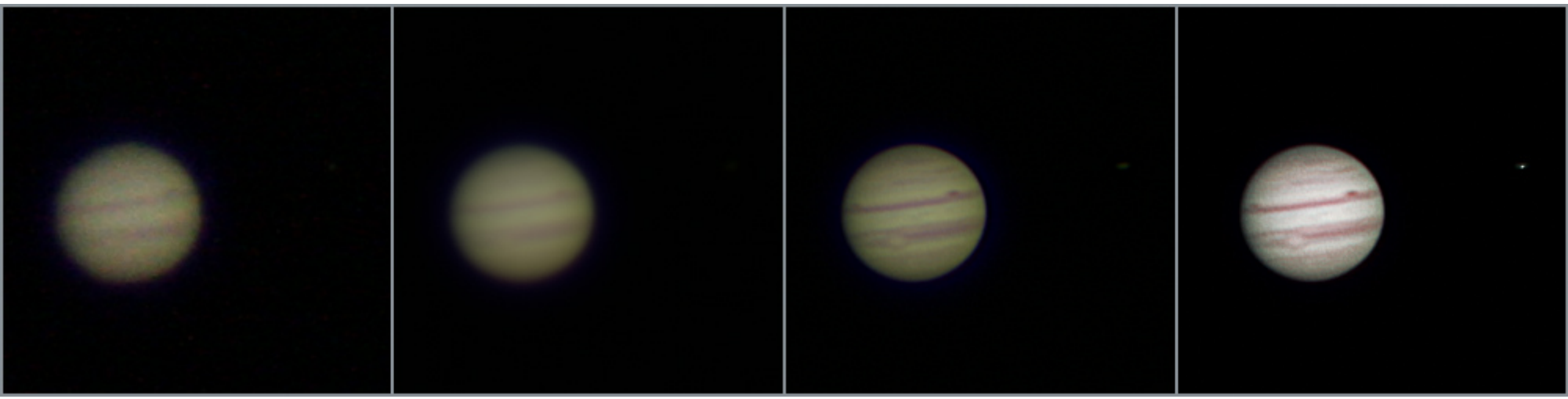

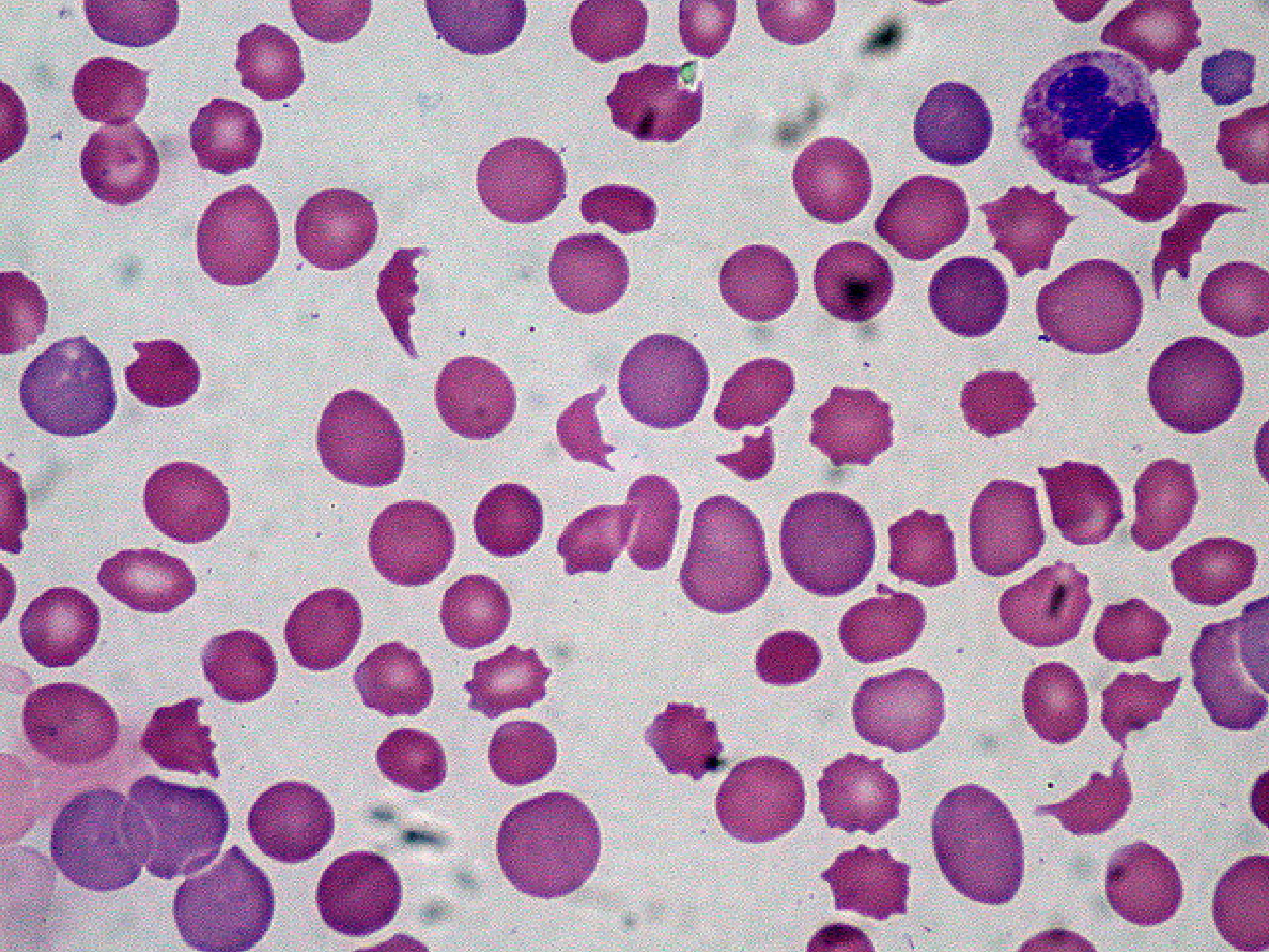


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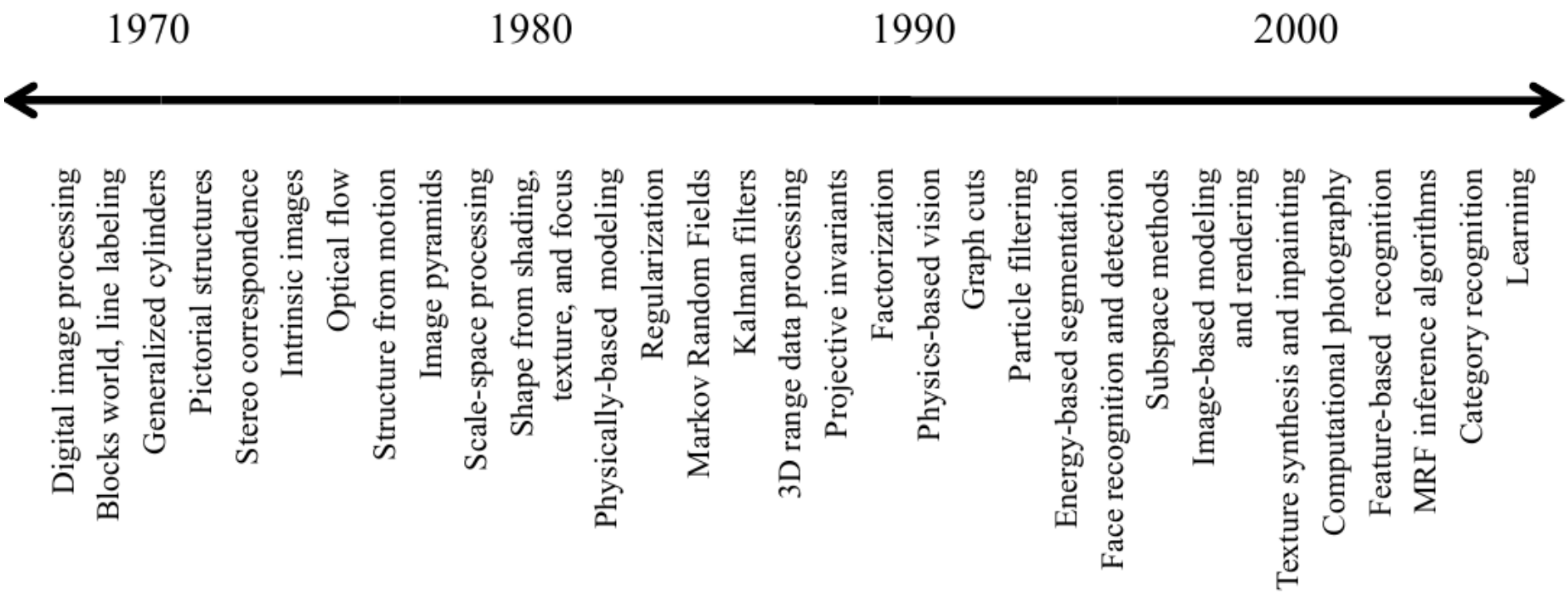
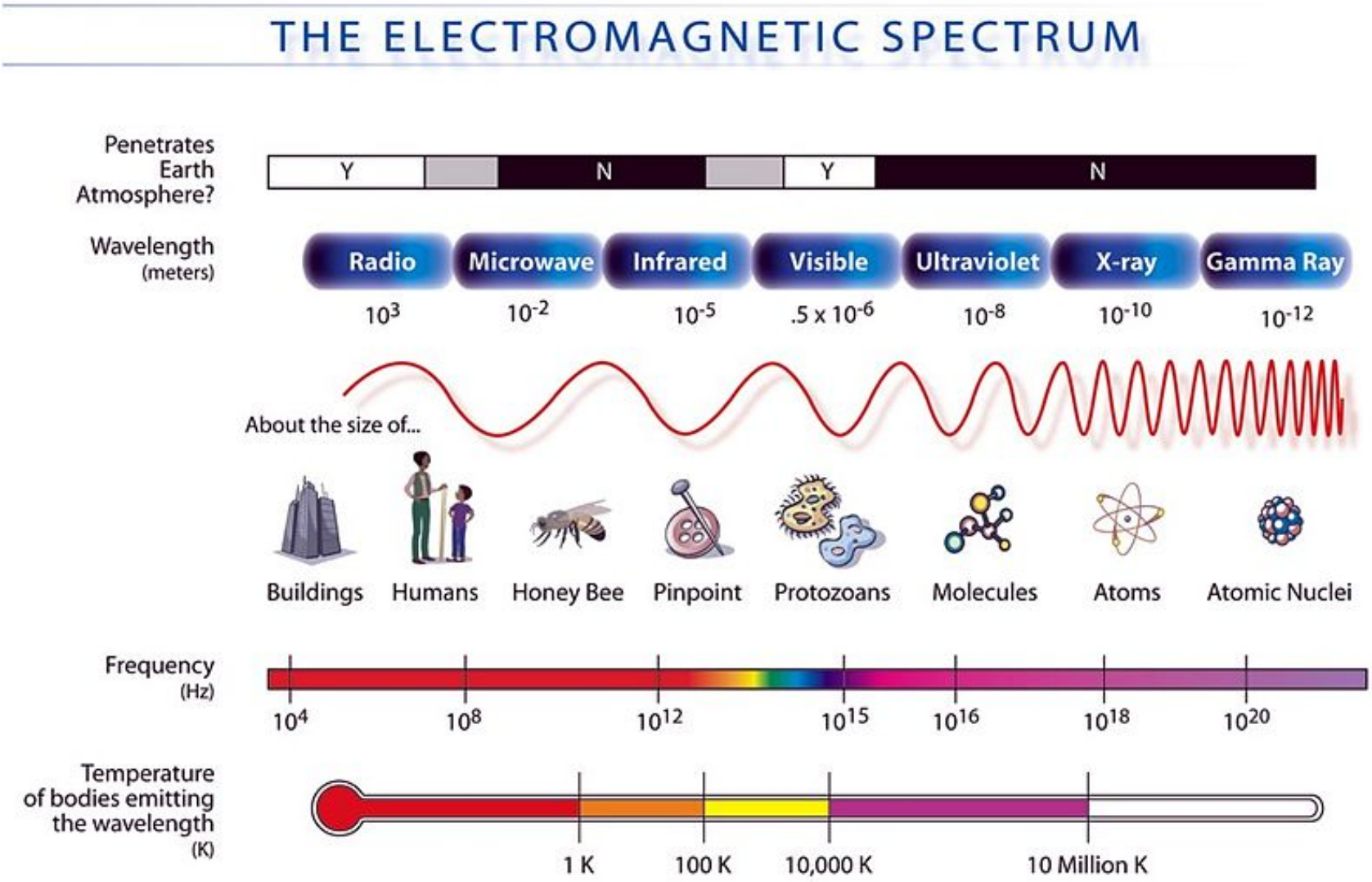
Agenda

History

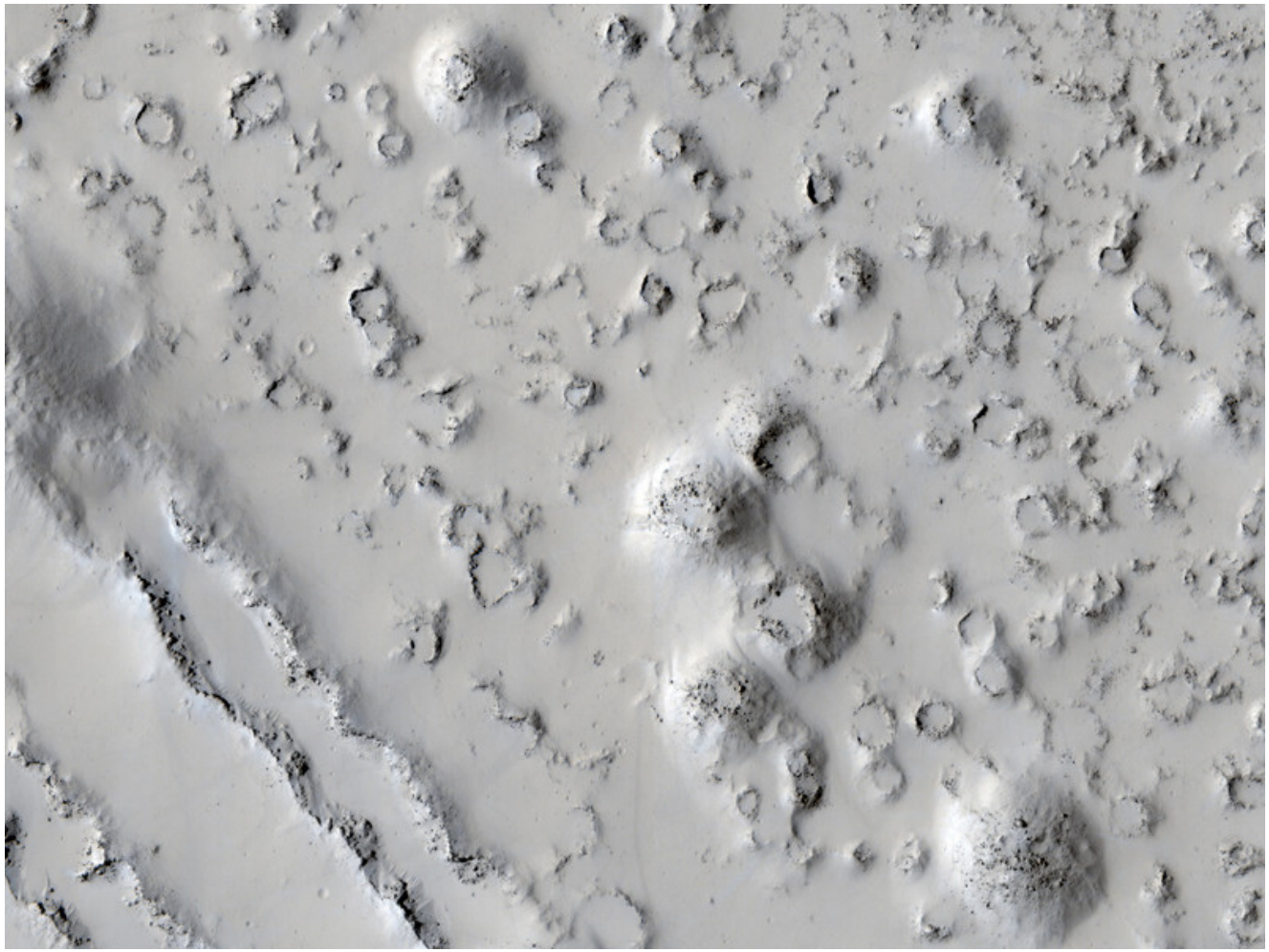

1970
1980
1990
2000
Digital image processing
Blocks world, line labeling
Generalized cylinders
Pictorial structures
Stereo correspondence
Intrinsic images
Optical flow
Structure from motion
Image pyramids
Scale-space processing
Shape from shading, texture, and focus
Physically-based modeling
Regularization
Markov Random Fields
Kalman filters
3D range data processing
Projective invariants
Factorization
Physics-based vision
Graph cuts
Particle filtering
Energy-based segmentation
Face recognition and detection
Subspace methods
Image-based modeling and rendering
Texture synthesis and inpainting
Computational photography
Feature-based recognition
MRF inference algorithms
Category recognition
Learning

Electromagnetic Spectrum

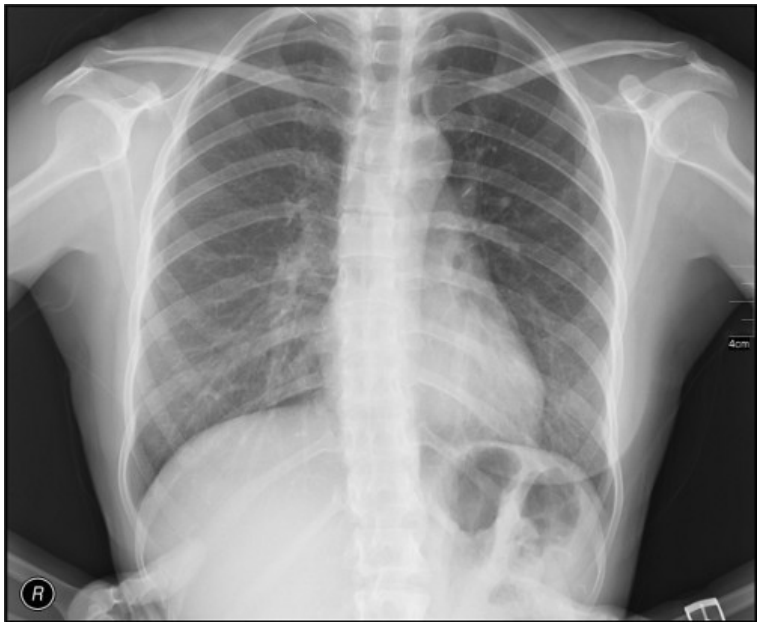


Natural images

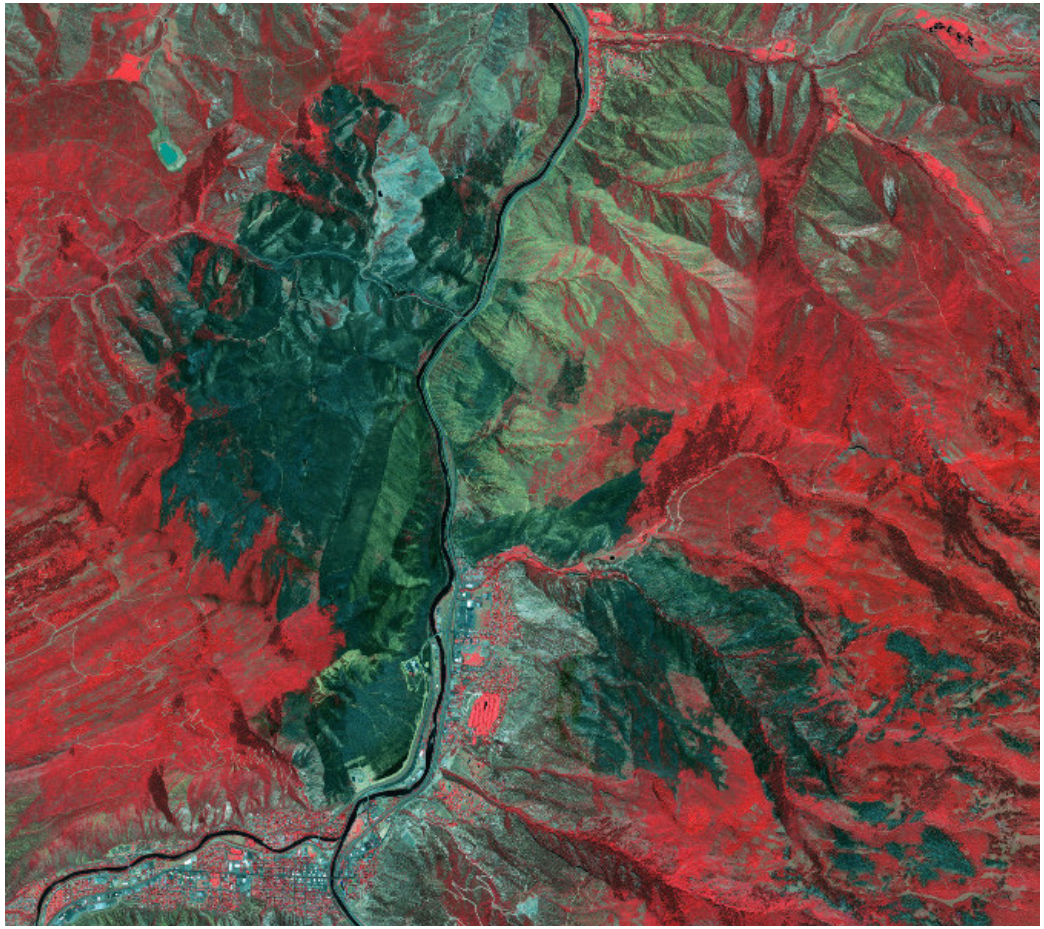
Scientific images



Medical imaging



Remote sensing



Programming language

- `python` with `numpy`, `imageio`, `scipy`.

Grading

- Exams for each module (Moodle/eDisciplinas) E
- Programming assignments (run.codes) A

Grading

Harmonic mean considering:

- The arithmetic mean within each grading item:

$$\frac{3}{\frac{1}{E+5} + \frac{2}{A+5}} - 5$$

Grading

Assignments

- Developed **individually** using `python` + `numpy`, `imageio`, `scipy`. No other library is allowed.

Contents repository

Course contents, schedule, slides, announcements and quizzes

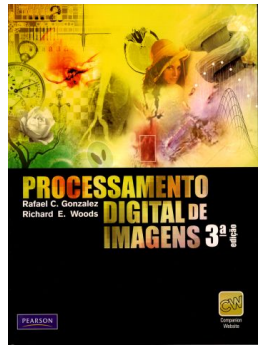
- `https://edisciplinas.usp.br`

Communication

- Discord (see link at the eDisciplinas page)

Bibliography I

GONZALEZ, R.C.; WOODS, R.E. **Processamento Digital de Imagens**, 3.ed
Pearson, 2010.



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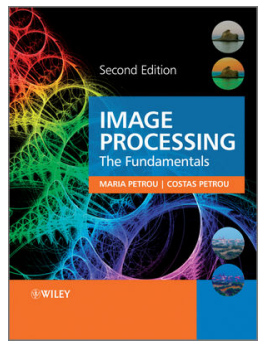

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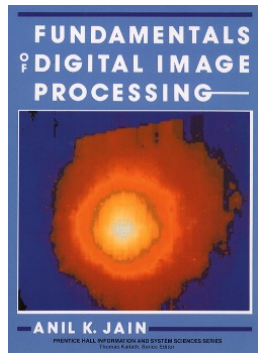

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Springer, 2011.

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